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ABSTRACT

This paper describes two experiences in which traditional face-to-face and World Wide Web-based teaching methods were combined at the University of Barcelona (Spain) as part of a regular course in Environmental Education for student teachers. The first experience took place within the university when a Web-based module was delivered to a group of students attending the regular course at the same time. The second experience was carried out in collaboration with the University of Barcelona, the University of Bangor-Wales, the University of Illes Balears (Spain), and Nottingham Trent State University (England). Thirty-five lecturers and pre-service teachers took place in an online debate about the role of teachers in environmental education. In both cases the students were assessed. Topics discussed in the paper include: (1) background on the REM (Reseau d'Enseignement Multimedia) project, funded by the European Union; (2) the evaluation approach, which included observation of students, face-to-face meetings, personal interviews, recordings of student interactions with the Web-based material, and personal diaries; (3) evaluation of the first experience, including institutional aspects, communication processes, design of the materials and activities, and participants' expectations and attitudes; (4) evaluation of the second experience; and (5) recommendations for the future. (Author/DLS)

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Virtual Classrooms in Traditional Universities: Changing Teaching Cultures Through Telematics

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Abstract: The integration of new telematics-based teaching methods in traditional universities will be an important challenge for academic institutions in the future. Telematics is the tool that can definitely change many of the methods normally used to deliver lectures. It makes the organisation of curricula and the delivery of courses more flexible. This paper deals with the evaluation of the implementation of two experiences, a web-based module that combines regular face-to-face interactions, and an international debate. The experiences are part of the project REM (Réseau d'Enseignment Multimedia), funded by the European Union (Telematics Applications Program). In this project, eleven Higher Education institutions collaborate producing course materials and teaching resources with the aim of offering international courses in virtual classroom environments. We conclude with some recommendations for future developments, especially for those situations in which participants share the same virtual classrooms.

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1. Introduction

This paper describes two experiences in which traditional face-to-face and Web-based teaching methods were combined at the University of Barcelona as part of a regular course in Environmental Education for student teachers. Both experiences belong to a two-year project funded by the European Union and included in the Telematics Applications Program. This supports projects in different areas, aiming to research, develop and demonstrate innovative applications of telematics environments; one of these areas is Education and Training.

The first experience took place at the University of Barcelona with no external participants. During the first semester of the academic year 1996-97, we delivered a Web-based module in Environmental Education to a group of pre-service teachers attending the regular course at the same time. The design of the module interface included both tutor-student and pier-pier communication areas, allowing a full telematics-based delivery system.

The second experience was carried out in collaboration with the University of Bangor-Wales, the University of Illes Balears and Nottingham Trent University. Thirty-five lecturers and pre-service students took part. It involved an on-line debate about the role of teachers in environmental education. In both cases the students were assessed.

The results of the evaluation of both experiences are intended to pave the way for overcoming many problems we identified during the activities and at the end of them. This will serve to design models of collaboration and course delivery in international settings during the third year of the project.

2. Background

Over the last years, a lot of attention has been paid to studying the possibilities of using Internet as a vehicle for distance education. The communication between the actors of the teaching and learning process is an added value to the varied learning environments created around telematics support tools. Moreover, the emergent web-based learning systems allow us to envisage a very changeable panorama in course delivery.

New virtual learning environments make it possible for a course to be delivered fully through the network, thus opening the possibility of a virtual classroom. New institutions are blossoming around this powerful idea, including new distance universities generally based on Web interfaces.

How are traditional Higher Education institutions facing this new panorama? What cultural and

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organisational changes will these institutions face in the future? How do teachers and students take advantage of the possibility of participating in international courses using Internet? Before having a clear answer to these questions, we need to validate experiences in which all the mentioned factors are put into practice.

Since 1996, eleven universities in seven countries are involved in a project funded by the European Union. This is called REM (Réseau d'Enseignement Multimedia)[1]. The main objective of this project is to create a telematics-based environment for co-operation between lecturers and students in international settings. The project, currently in its third year, aims to produce a distributed database of multimedia resources for teachers training accessible through the Web. It is also aimed at creating collaborative teaching experiences between universities across Europe, including the delivery of common courses.

So far the University of Barcelona, one of the participant universities, has created several modules in the areas of Environmental Education, Open and Distance Learning and European Learning.

The REM chapter of the University of Barcelona has already organised several collaborative experiences in this project, such as web-based course delivery, and international debates on different issues. In this paper, we analyse some of the issues arisen from the experience.

3. Evaluation Approach

As Cullen points out [Cullen et alt., 1995], focusing on innovation as the subject of evaluation implies evaluating the project in all its complexity, considering both space and time dimensions and in relation to its integration in the project, in the programme and also in organisational and social environments. It is also important to understand the nature of the innovation, not as a finished product or service, but as a process. The evaluation should be multi-faceted, contextualised and evolving and there should be a holistic approach to needs.

Following this approach, we focused the evaluation process in the study of a number of factors when planning to study the key issues related to the use of this new learning environments. These were: institutional/organisational issues, communication processes, teaching and learning processes, expectations and attitudes of participants, and technological factors.

The students and the lecturer who participated in the experiences were chosen from a "Environmental Education" regular course. The lecturer had already participated in the design of the module as subject matter expert. Students were selected on the basis of computer skills (basic use of computer programs) and their command of English. The trial itself lasted for one month and a half.

For the gathering of data, we used several methods and tools. We decided to collect relevant data, so we used both traditional and innovative tools to obtain different types of information. We used observations of pupils while they followed the module, face-to-face meetings and personal interviews. But we also followed some work sessions in which we digitally recorded the students' interactions with the Web-based material by using a program that created a file with the path students followed up throughout the module. We used a program called "Lotus ScreenCam". Since this program also allowed us to record sound, we asked the students to "think aloud" during some sessions, so as to reconstruct interactions in a reliable way.

The main and most useful source of information were the personal diaries the students sent to the tutor weekly, in which they reviewed critical aspects of their work, motivation and learning.

A thorough evaluation of the process and results was undertaken during and after the experience in order to identify, describe, analyse and critically assess the results of using a so-called "REM module" in combination with face-to-face interactions. A similar process was undertaken for evaluating the second experience, an asynchronous international debate, that we describe later.

Now that the evaluation analysis has been completed, we will move on to present some of the most relevant results.

4. First experience: Web-Based Module Delivery Combined with Face-to-Face Regular Classroom.

At the beginning of 1997, REM-Barcelona organised a "pilot course" using a Web-based interface for delivering a module which belonged to a course on Environmental Education. The course is attended by student teachers in their second year.

Learning arrangements were carried out around three main figures: the tutor, the lecturer, and the technical staff. The role of the tutor was very important. First, the tutor was in charge of the day-to-day

[1] You can find more information about this project in http://etic.doe.d5.ub.es/rem

communication, which meant answering the students' queries about the module content and organising the virtual environment. The regular lecturer received and marked the assignments, and then contacted the students to reply them. The technician was in charge of keeping the system running and solving any query from the participants related to the functioning of the system.

In order to give support to the lecturer and students on the uses of the communication tools, we also included a Web-based module called "Telematics Tools", which belonged to another REM course area. This training took place in both face-to-face and self-learning sessions. For two weeks, participants learnt how to use different telematics tools such as e-mail and distribution lists, querying databases and net search, and became familiar with the Web environment.

4.1. Institutional aspects

The University of Barcelona provided computer rooms with enough equipment for the students. Nevertheless, we found numerous management problems, something we consider to be characteristic of traditional institutions such as the UB. For instance, those responsible for the labs were reluctant to give access to the students. In addition, many technical problems arose during the experience: old communication protocols that needed to be updated, different software versions, etc. The fact that the University has a centralised maintenance service was a disadvantage for setting up the whole experience.

The Environmental Education lecturer participating in the experience showed much interest in it from the very beginning. The lecturer wanted to offer the students a different concept of learning in a new environment. The lecturer was also enthusiastic about being in contact with innovative technologies. However some problems arise, in our opinion, when putting innovations into practice, since some attitudes are difficult to change. For instance, the distance tutoring methods were not totally assumed by the lecturer, as demonstrated by the fact of sometimes giving feedback in the regular classroom instead of using e-mail. It was not a technical problem, but a "cultural" one [Fullan 1993], [Sancho 1993]. Lecturers need to become familiar not only with the new tools, but also with the flexible learning interaction processes. Such changes take time.

4.2. Communication processes

The students followed the module and other activities during a time-sharing schedule independent from the regular face-to-face one. The communication framework set up during the experience was based on e-mail and distribution lists. In addition, we included Internet Relay Chat. We then designed two main areas of communication in the virtual classroom:

- Private area. It was a space very close to the participants. There was one-to-one interaction (teacher - student and/or student - student). The communication needs of that area were covered basically by regular e-mailing.
- Public area. It was a common space that allowed participants to express their opinions in public, share their homework, etc. The communication needs of this area were covered partly with an e-mail list and partly by using World Wide Web as a vehicle to deliver course material. Internet Relay Chat (IRC) was used as a secondary tool to contact piers.

With respect to the message flow, students sent as many as 113 messages. The distribution list (public area) received 43% of them, while the Environmental Education tutor received 33%, the regular lecturer 18% and the technical staff 11%. Regarding these figures, we must make it clear that we are not including personal messages between students, since we decided to respect their privacy.

From this data, we clearly see that the level of communication was high, considering that the students had never used these tools before. Most of the messages were related to the module content. The low number of messages related to technical or institutional problems demonstrates that, although there were some problems in this respect, the communication was successful and achieved its aims. Participant students were surprised by the fact that Computer Mediated Communication tools were so effective and able to communicate not only knowledge, but also personal emotions.

We identified some gaps in the communication processes which had to be filled. First of all, students needed more practice at using tools, for the 4-hour training sessions we delivered were not enough. At the end of the experience, all these problems could be overcome. Management of the computer rooms also hindered the communication processes to some extent, for the labs were open for all university students at the same time. This meant those involved in the experience found it hard to access a computer.

More important than that was the lack of feedback by the regular lecturer. The students indicated that the face-to-face lecturer was not sending responses as often as they expected. This means the lecturer needs to play a much more active role in this setting. We also detected some problems of information overflow. The students were not used to accessing the fragment-based information in the WWW and felt

stressed ("I felt sunk in an ocean of data").

4.3. Design of the materials and activities

All students pointed out that both the materials and the learning activities had been very innovative. The students showed a positive opinion about the content of the Environmental Education module, as well as about the introductory module (Tools for Communication) they completed. They were positively impressed by the possibilities of the hypermedia content organisation, including access to materials in the Web different from the ones specifically included in the pages. The selected activities achieved the learning goals and allowed reflecting on the contents in a different way than in the face-face class. The Chat, integrated as an important learning activity in the designed module, was also considered as a positive experience for students. However, the fact that no other REM universities participated (as originally planned) hindered its efficiency. Chats integrated in the activities of the module are an opportunity for communication and reflection, but they are useful with piers not belonging to the Campus.

We have detected some minor problems concerning the materials. For instance the use of video-clips caused some problems because of the poor quality of the images and the still slow delivery over the net. On the other hand, the sequences selected were not very significant for learning, given its short duration.

Students had the opportunity of printing the materials, so they did not need to read for long in the computer screen. Another problem was posed by the fact that some materials were in English, and although foreign language skills were relevant in the selection process, students had problems in reading these texts on time. This shows the need to find new ways of organising texts, such as using translated documents in all participants' languages combined with abstracts of the same documents.

There are opposed opinions regarding the organisation of materials and the scheduling of activities. While some students said that the freedom of browsing the module contents caused a waste of time, others appreciated this possibility very much. We consider this to be related to the different learning styles, but we do not have enough information at present. Therefore, this issue should be taken into account for further research.

Some participants find it hard to organise their time in flexible learning environments, since they have to combine a fixed class schedule and the flexible interactions of telematics. As a result of this, some tensions arise.

4.4. Participants' expectations and attitudes.

Participants' expectations varied depending on their roles and responsibilities. We basically analysed the expectations of students and lectures.

Fourteen students were willing to participate in the experience. Six of them were selected according to a main criterion: their command of English. Other considerations, for instance computer skills, previous experience in international projects and further activities in the Environment area were also considered. As a result of the selection procedure, we had a group of students with different skill levels and experiences. The expectations of the students were different according to their background.

The expectations were formally related to the contract the students agreed to sign up. They committed themselves to browse the course module, contact students from other Universities, learn new Internet tools, and have an e-mail account for a semester. The students could have the module recognised as part of the subject "Environmental Education", since they were formally assessed. They then stated their commitment to develop the module activities, answer two questionnaires, participate in an entry-training course, and produce a personal diary as well as a final report. At the end, the students also received a certificate of participation.

During the trial process, we took into consideration the attitudes of the students when confronted with new learning situations. We concluded that there were no negative attitudes towards the teaching methods and tools used during the experience. On the contrary, they adapted very well to the new learning environment. It is important to mention that students reacted well to the new demands of the activities proposed. They soon realised that they had a much more active role in their learning process. They increased their level of reflection [Knapp & Petersen 1993] during the course, evolving from providing mere descriptions to relating the environmental issues to social and political contexts. This was shown in the written assignments, which were qualitatively different from the oral discourse of the face-to-face classrooms. Furthermore, a new attitude appears to arise in the relationship between students and tutors/lectures: a more friendly environment emerged around the electronic mail, as demonstrated by the use of more informal language between all participants than in the regular classroom and the greater number of enquiries. Students were definitely confronted with the possibility of breaking the narrow wall

of the classroom.

The expectations of the lecturer were ambiguous to some extent, and in fact close to reproducing the models of the face-to-face teaching. The lecturer did not have a clear idea of the new teaching role. This fact suggests that it is probably more difficult for lecturers to change attitudes than it is for students. Maybe the accumulated experience of a professional career hinders the understanding of new teaching methods in some way.

5. Second Experience: International debate

The second experience was an international debate with 30 participants, between students and teachers, from 4 REM universities. These were Bangor, Nottingham, Illes Balears and Barcelona. The debate, called "Environmental Education in a Distance Learning Environment: The Role of the Teacher", was also part of the module on Environmental Education.

Participants were regular lecturers of this subject in the universities mentioned, students, tutors and two secondary school teachers doing practice in Environmental Education. The local tutor of the University of Barcelona acted as moderator.

The main goal of the debate was to test an adapted version of the Lehrer model [Lehrer et al., 1994] in a telematics-based situation. The Lehrer model is an important component of REM pedagogical foundations. It organises contents in four basic steps: planning, transforming, evaluating and revising. This provides a very solid base for students, who can research a knowledge area and then discuss their findings in an organised way, by following the mentioned steps.

All participants could also access a base document for brainstorming (a sub-phase of planning stage) the discussion. This document, "Computers and the Environmental Education", was available in English and Spanish. In this case, English was the language used in the discussion.

From the technical point of view, the debate was hosted in the server of the University of Bangor and developed in a First-Class server. The role of the moderator was unobtrusive. He had to make sure that the messages were related to the topic of discussion and decided when to shift to the next step according to the model mentioned before. A Web page (http://www.doe.d5.ub.es/etic/Debate/index.html) was created for all those interested in analysing the debate process.

According to the participants, the results were highly satisfactory, although we detected a far too great influence of the Anglo-Saxon lecturers in the discussion, given that the debate was carried out in English. Too long messages hindered the discussion, since the participants did not take into account the limitations of the textual-based exchange. Local students in Barcelona and in Balearic Islands, although they were relatively fluent in this language, sent less messages that the students from the UK Universities.

The role of the moderator, who kept the discussion very open, was also an obstacle for coming to conclusions in the different stages of it. We assume now that the moderator should lead the discussion, and set clear rules of debating from the very beginning.

6. Some recommendations for the future

Despite the difficulties mentioned, we have demonstrated that the REM telematics-based collaborative teaching and learning environment is feasible, not only in our traditional universities, but in nearly all learning situations. The REM pedagogic model proved to work in a satisfactory way, for it allowed flexible course delivery and international collaboration.

With this experience, we have paved the way for REM to successfully undertake course-lecturing collaborations in Telematics environments in the future. This experience has clearly demonstrated that Computer-Mediated Communication learning tools can be used in traditional institutions, such as most of the REM universities, although improvements are necessary in many respects.

First of all, if REM deals with collaboration, we have to determine how, who, and when the collaboration takes place. During the validation, there was a feeling of disappointment, especially among the students. This was due to the fact that the promise of international participation in the course delivery was finally honoured in the breach.

It is also important to ensure the in-site institutional collaboration before launching a programme of activities, and to make sure that we will have support for solving technical and organisational problems. If we want this kind of learning system to become commonplace in traditional institutions, we need much stronger support from them, as well as a policy of innovation able to integrate experiences like that in the day-to-day teaching. We do not mean that research teams should make a greater effort to solve all the technical and management issues. The solution would be a shift in the way large institutions (based on face-to-face education) incorporate flexible teaching methods. There is a need for a new mentality. Education institutions are to consider the introduction of innovative methods and technologies as part of

their policy, which means planning resources and facilitating the involvement of the regular staff.

In that respect, staff training is a key issue, not only in relation to the use of telematics tools, but first and foremost, in the implementation of flexible teaching methods. Easy access to telematics tools should be ensured in the institution, and ideally in the participants' home.

There is a clear tension between a flexible approach to the delivery of the courses and the need to have a fixed timetable. This will be much more important in future REM collaborations, especially if we also consider another added problem: the different course calendars of Universities in Europe.

Finally, language problems are also a key issue in international learning settings. At the European level, in which language diversity is seen as a cultural plus, there are not clear responses to that.

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